



TECHNICAL BULLETIN CP-01

CHEMICAL GROUTS: HYDROPHOBIC VS. HYDROPHILIC

CHEMICAL GROUTING

For decades, chemical grouts have been used to seal fractures within sound substrates and to stabilize unsound earthen materials. These substrates can vary from 4" thick concrete walls to tons of loose soil. In all instances, moisture is present. Depending on the situation, a decision is made whether to use the water present as part of the solution, or move the water out of the problem area all together. Chemical grouts, primarily based on urethane technology, are injected or placed into these situations to serve as the remedy. Polyurethane chemical grouts are separated into two distinct categories, hydrophobic and hydrophilic.

HYDROPHOBIC GROUTS

Simply translated as a "water fearing" material, hydrophobic grouts have little to no affinity for water. These grouts need very little, if any, water to react and cure. Once cured, hydrophobic grouts resemble a rigid foam, containing an open cell structure (see photo). These grouts are typically supplied as a single component material with an available accelerator. However, more dual component grouts are appearing, which have a very short reaction time and quickly transform from a liquid to their final rigid foam form. As hydrophobic grouts expand and cure, they repel water and push it further back into the substrate and into the micro-cracks and fissures that extend from the main crack. As a result of hydrophobic grouts not being able to absorb water in their reaction, they fail to displace the water in these micro-cracks and fissures, thus they are unable to establish a strong mechanical bond to the interior walls of a crack. These grouts retain their shape and size once cured. Dry spells within the substrate won't affect the material. The cured grout can only be displaced if the crack, joint, or substrate is compressed. This will compress the grout and due to its limited bond capability, it won't be able to expand back into its original size when the surrounding environment expands.

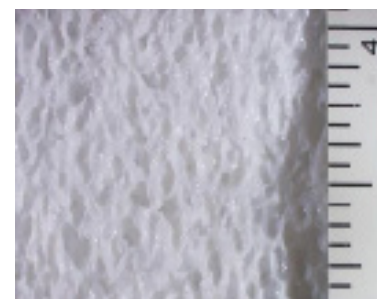


Hydrophobic have three attributes that make them attractive to contractors.

- Ultra-low viscosities for sealing fine cracks and for soaking into loose soils
- Reaction times are controlled through the use of an accelerator
- Massive expansion allows for the filling of large voids with minimal material

HYDROPHILIC GROUTS

At the other side of the chemical grouting spectrum are hydrophilic or "water loving" materials. Hydrophilic grouts thrive on water and seek it out within the crack and all the tributaries and fissures associated with it. This type of grout cures to a flexible foam or gel (see photo). During their curing process, hydrophilic grouts absorb and retain water molecules. This process allows them to expand into and replace the water that may be lurking in the finer cracks and fissures that extend from the main crack being treated. This is the key





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attribute that makes hydrophilic grouts preferred over the hydrophobic type in situations where movement along the crack is expected. A tenacious mechanical bond is created within the dynamic crack due to the grout's ability to lock itself into the crack. As the crack goes through expansion and contraction cycles, the hydrophilic grouts easily move with it.

Hydrophilic grouts need to constantly be in the presence of water. Long dry periods will cause the grout to dehydrate and shrink, creating the possibility of leakage through the treated area. Mining & tunneling projects are prime applications for the hydrophilic type of chemical grout. Other applications include below grade walls where a high water table exists and the repair of faulty or poorly installed PVC and expandable bentonite water-stops.

Regardless of the type of chemical grout used on the project, the application means and methods are relatively the same. There are numerous applications where either type of grout will perform perfectly. The key to chemical grouting is delivering the material to the point where water is invading the substrate and closing down that point of entry.